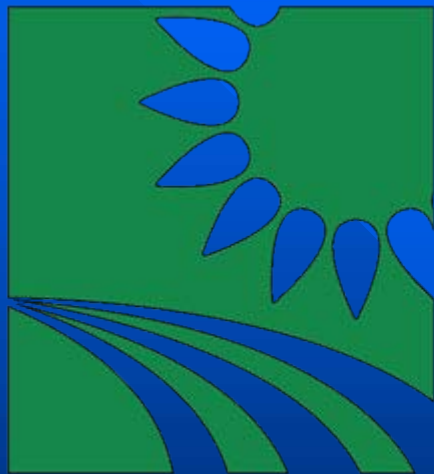


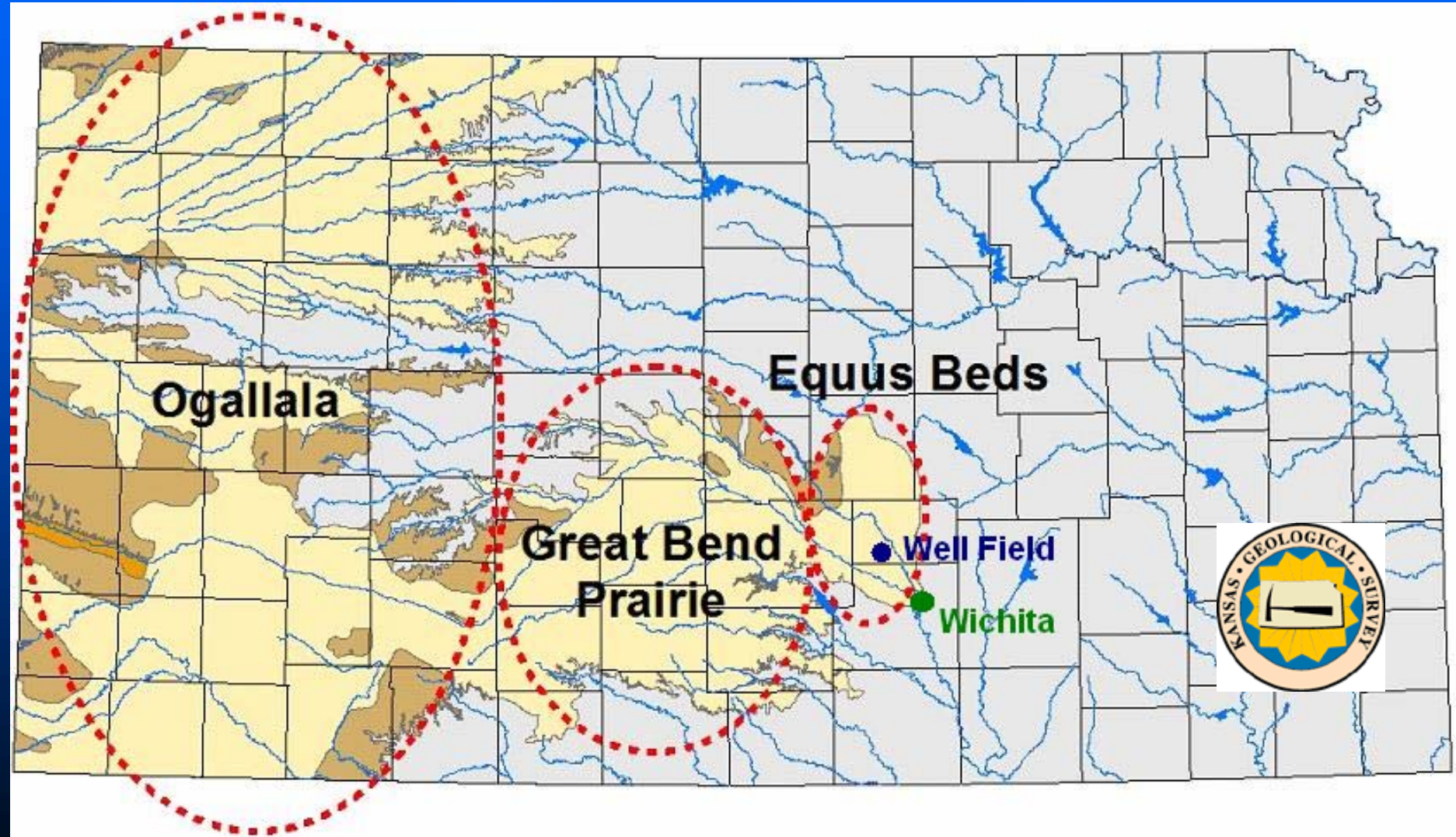
City of Wichita Aquifer Storage and Recovery Project



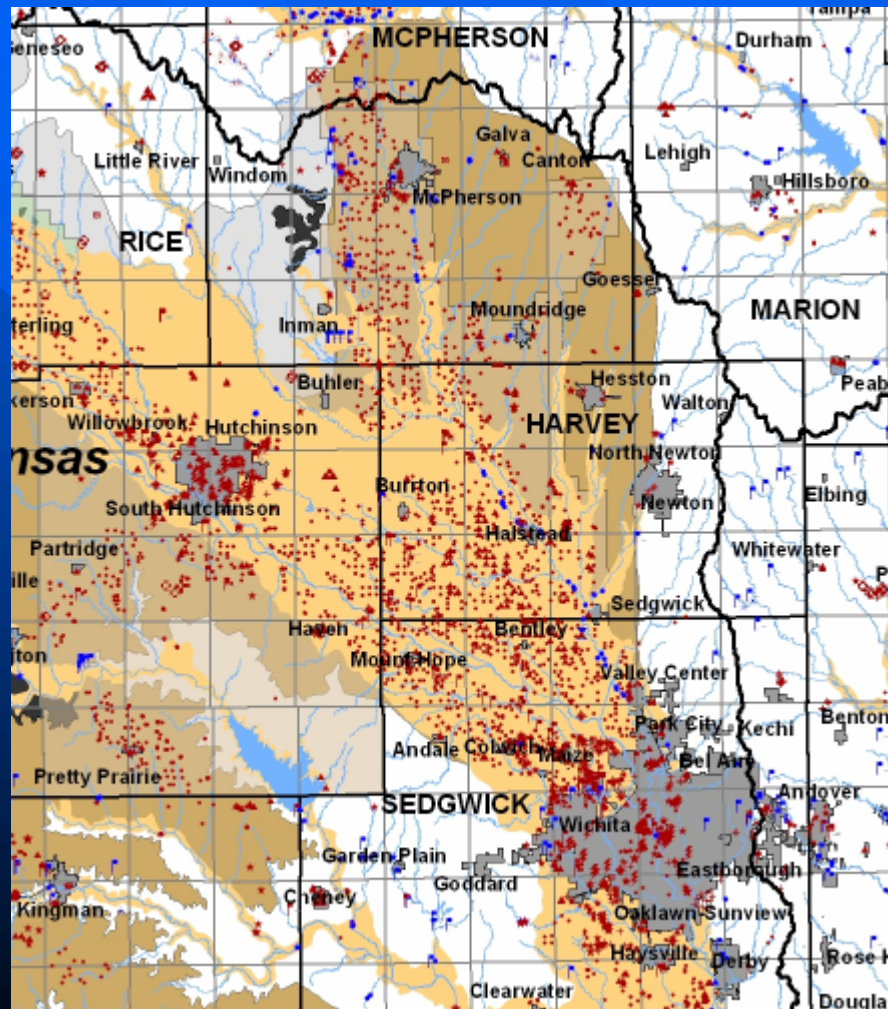
KANSAS
DEPARTMENT OF
AGRICULTURE

Lane P. Letourneau, L.G. – Water Appropriation Program Manager
Division of Water Resources

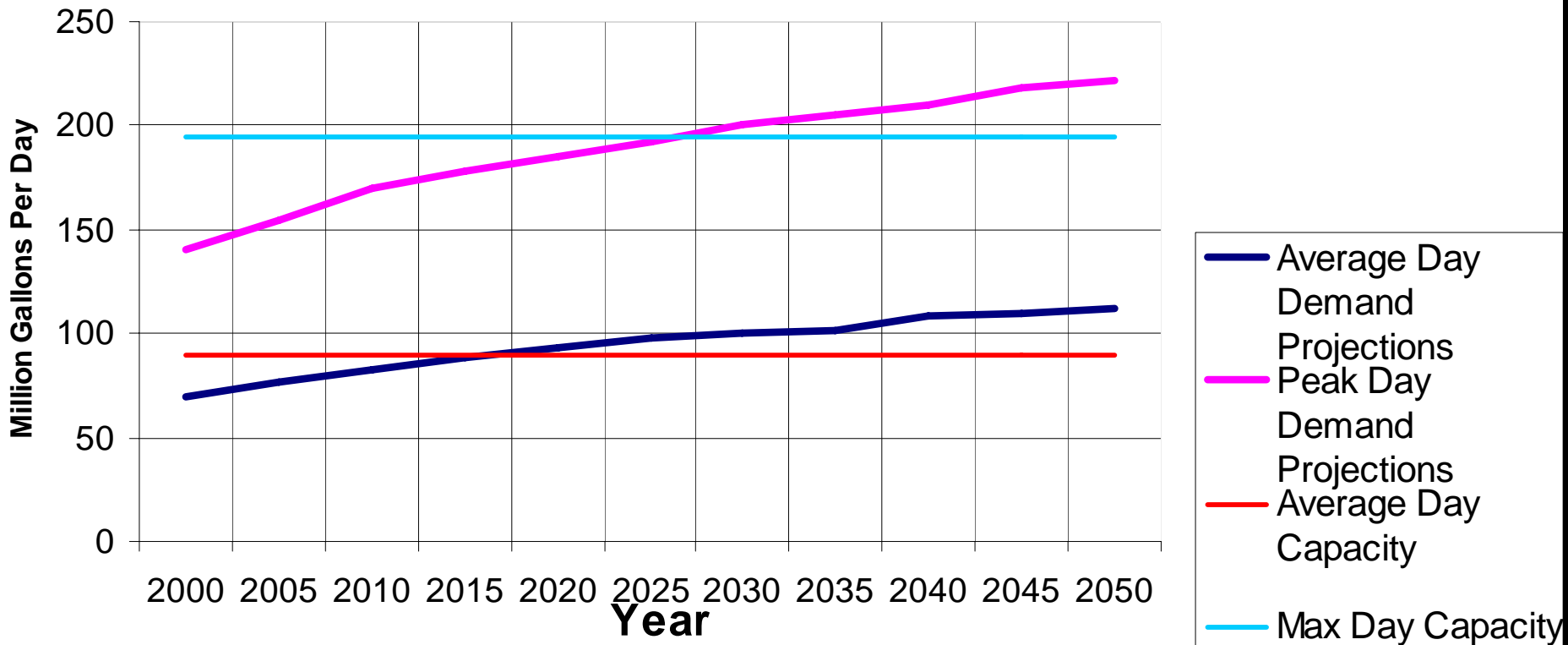
Project Location



The Equus Beds Aquifer is not only a major source of water supply for the City of Wichita, but also a major source of water for agricultural and industrial use for the surrounding area, resulting in water level declines.



Projected Water Supply Demands



Water Supply Planning

- City began looking for future water supplies in the 1980's.
- City considered alternatives, such as a pipeline to Milford Reservoir.
- Integrated Local Water Supply Plan approved in 1993.

Integrated Local Water Supply Plan (ILWS Plan)

- Greater use of Cheney Reservoir.
- Conservation.
- Build a 100 MGD Aquifer Storage and Recovery (ASR) system.
- Re-develop the Bentley Reserve WF - 10 MGD.
- Expand Local Well Field - 45 MGD.
- Install additional raw water pipelines.
- Add a new water treatment plant - 65 MGD.

Studies by GMD2, USGS, and Bureau of Reclamation demonstrate that chloride brines and the Arkansas river will migrate into the well field area by 2050.

Chlorides will exceed 250 ppm throughout the area.

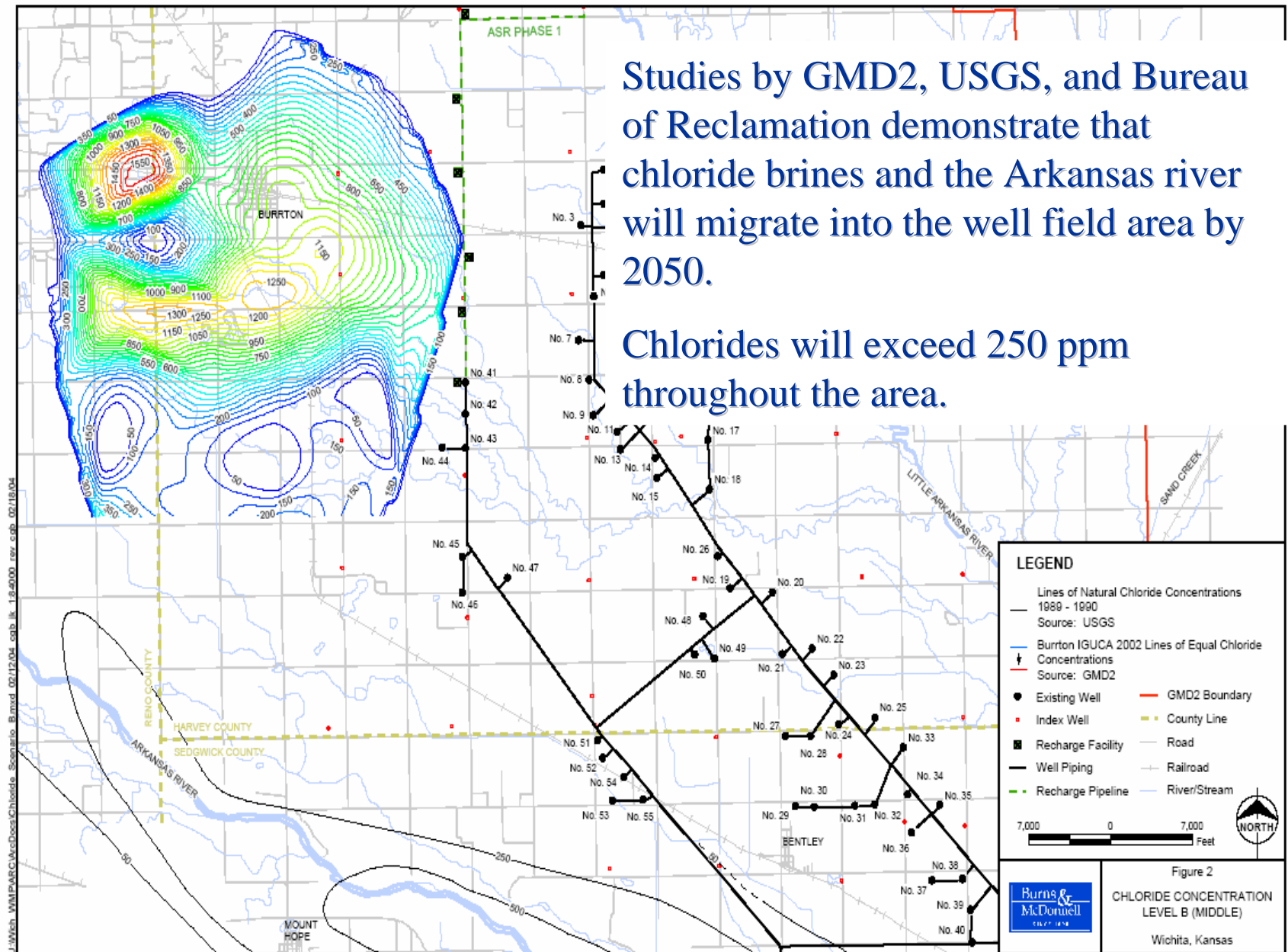
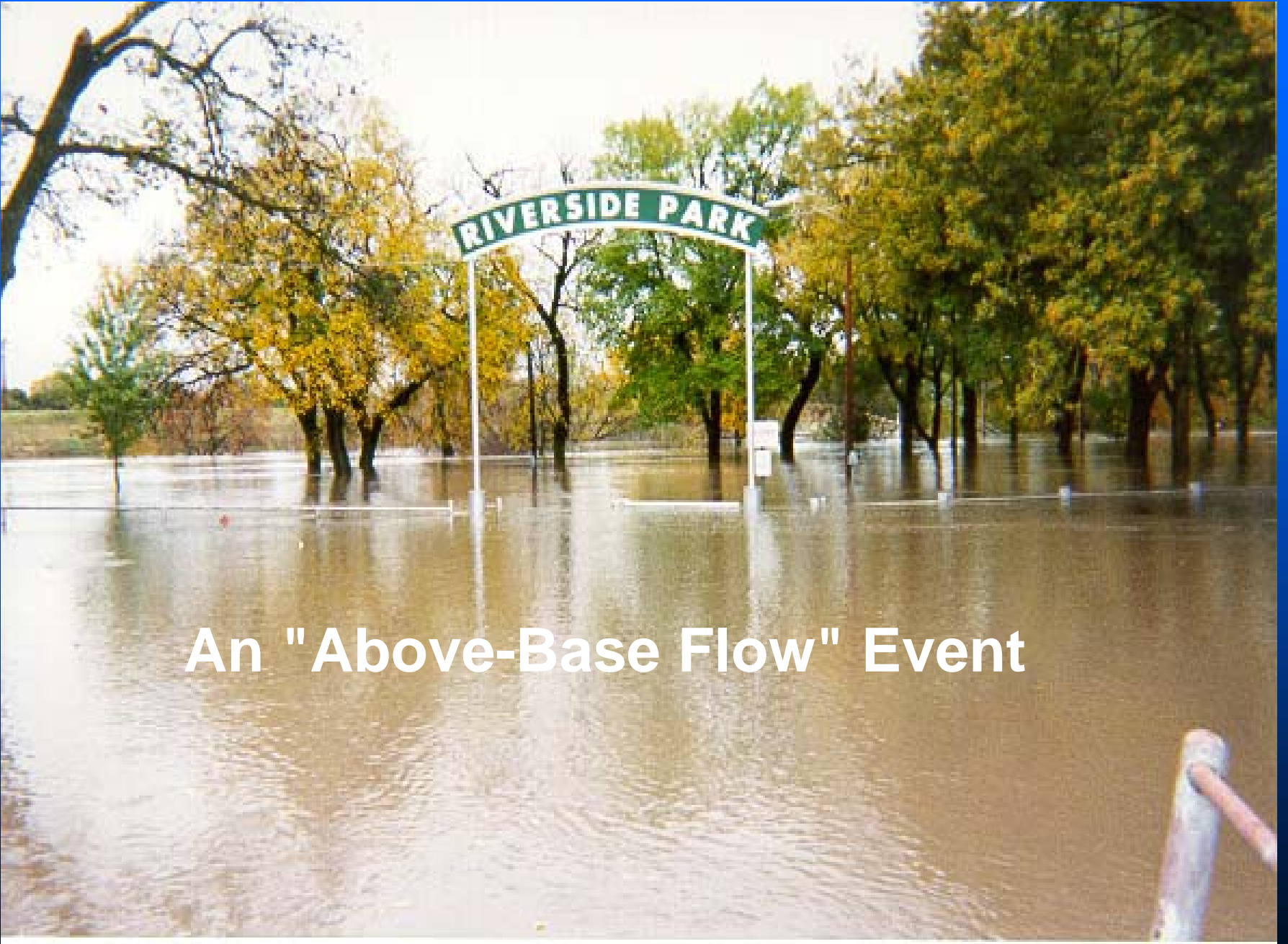
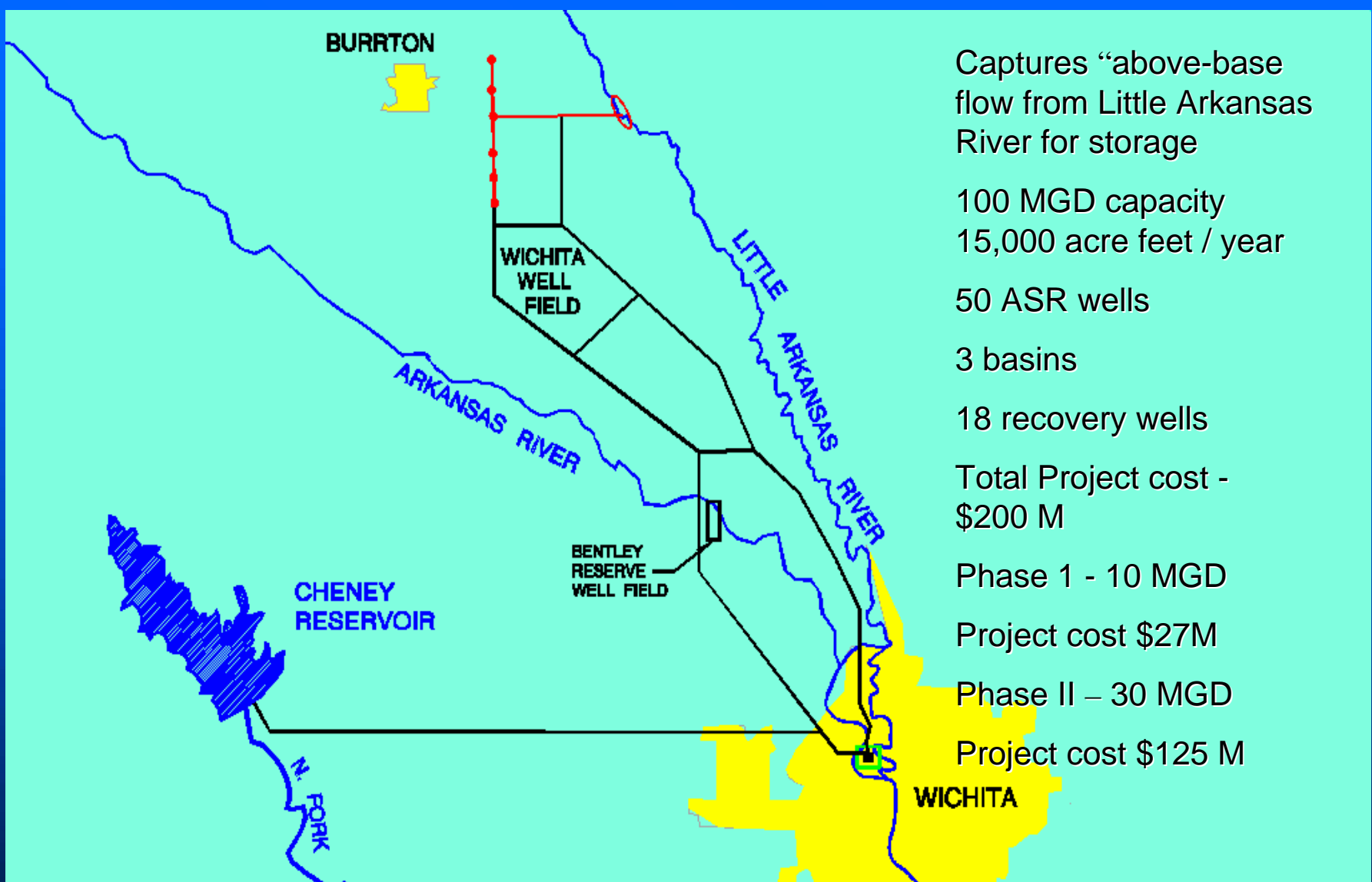


Figure 2
CHLORIDE CONCENTRATION
LEVEL B (MIDDLE)
Wichita, Kansas

A photograph showing a park entrance sign that reads "RIVERSIDE PARK" in white letters on a green arched background. The sign is supported by two white posts. The entire scene is submerged in murky, brown floodwater. In the background, several trees with green and yellowing leaves stand in the water. The sky is overcast and grey. The water's surface is calm, reflecting the sign and the surrounding trees.

RIVERSIDE PARK

An "Above-Base Flow" Event

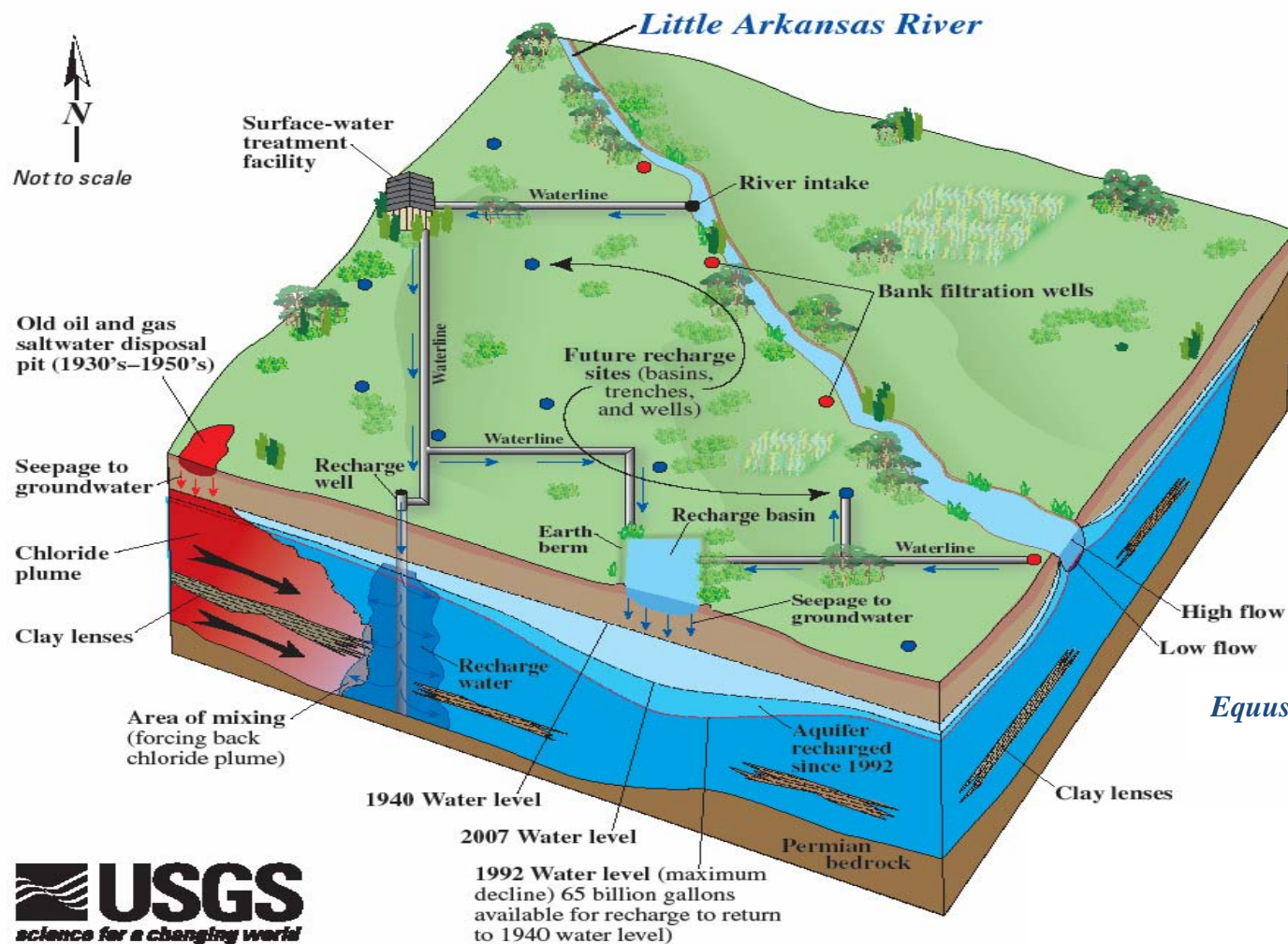


Equus Beds

Aquifer Storage & Recovery Project

Equus Beds Aquifer—Aquifer Storage and Recovery

Our Water Our Future



Kansas Regulations (Section 5-12)

Allow for Aquifer Storage and Recovery

Each application for a permit to appropriate water for artificial recharge shall include a methodology for accounting for water stored in a basin storage area both on an annual basis and on a cumulative basis so that recharge credits can be calculated.

The accounting of the water balance of all water entering and leaving the basin storage area shall be determined by using sound engineering methods based on actual measurements, generally accepted engineering methodology, or a combination of both.

Extensive Regulatory Controls on Project

- Project includes restrictions on flow conditions in the river.
- Installation of 7 additional monitoring wells near diversion wells.
- Class V permit from KDHE controls water quality to wells and basins.
- Installation of 28 monitoring wells near recharge sites.

K.A.R. 5-12-2

ASR Annual Accounting Requirements

- Natural and artificial recharge;
- Groundwater inflow and outflow;
- Evaporation and transpiration;
- Groundwater water diversions from all nondomestic wells;
- Infiltration from streams;
- Groundwater discharge to streams;
- Calculated recharge credits; and
- Any other information that in the opinion of the chief engineer is pertinent to the basin storage and surrounding areas.

K.A.R. 5-12-3

Public Hearing Requirements

A hearing shall be held by the chief engineer in the general vicinity where an applicant proposes aquifer storage and recovery before approval of any such application for aquifer storage and recovery.

Demonstration Project

- To address concerns about the ASR project, the City did a 5-year demonstration project to validate primary components of the project.
- Demonstration Project recharged over 1 billion gallons.

ASR Phase I

- Appropriation applications submitted to DWR, Nov. 2003.
- MOU approved by GMD and City Council Aug. 2004.
- DWR Public Hearing Dec. 2004.
- Appropriations granted in August of 2005.
- Construction began in March 2006.
- Construction completed Fall of 2006.

ASR Phase I

- Components of Phase I changed because testing found that River/Aquifer connection not as good as anticipated.
- Use fewer diversion wells and include a river intake.
- Include 7 MGD surface water treatment plant.

ASR Phase I

- 3 River Diversion Wells.
- One 7 MGD River Diversion.
- One 7 MGD Surface Water Treatment Plant (Ballasted Flocculation).
- 4 Recharge Wells.
- 2 Recharge Basins.
- 14 Miles of Overhead Power Lines









Performance of Diversion Wells

- Appropriations require at least 56 cfs in the river during irrigation season
- Drawdown less than 10 feet 660 feet from well
- Recovery to regional water level in less than 7 days
- No impairment to other groundwater users

Hydrograph Results

During the period shown the diversion wells pumped over 112 million gallons (345 acre feet), yet in less than one day the water levels in the monitoring wells returned to levels that were 4 to 6 feet **HIGHER** than they were before the City started pumping

Water Quality

- All water recharged must be below the Maximum Contaminate Level (MCL) established for drinking water.
- Currently treating surface water to remove atrazine.

Recharge Quantity

- 2006 – No recharge because of low flows in river.
- 2007- Over 350 million gallons recharged.

Phase II

- Will capture and recharge up to 30 MGD.
- Will only use treated surface water.
- Will have treatment plant that will treat the water adequately to go directly into recharge wells.
- Includes replacement of approximately 17 miles of existing raw water pipeline.

Phase II

- Will include 26 recharge/recovery wells, most at sites with existing municipal supply wells.
- Water quality established by KDHE – as safe as municipal water supply.

Phase II

- Design to start in 2008
- Construction to begin in 2009, complete by 2011.



Questions?